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many sorts, including various spiders, hymenoptera, and ground beetles, are powerful enemies of numerous plant-eating insects. Various insects, of which the milkweed bug and monarch caterpillar are examples, feed solely or chiefly upon certain weeds.

12. Wild fruits, berries, seeds, nuts, and roots contribute to the food supply of many persons, and in some instances were of great significance to pioneers and others.

OUTLINE FOR FIELD WORK IN GEOGRAPHY*

By WELLINGTON D. JONES and CARL O. SAUER

This outline has been prepared in recognition of the need of defining scope and methods of geographic field work. It is comprehensive enough to be adapted readily to almost any region. Although planned for individual, detailed field research, it also may be helpful in field work of other sorts. Numerous hints on preparations for field work and on field methods are given in order that the inexperienced field-worker may avoid some of the difficulties which commonly are encountered.

I. PREPARATIONS FOR FIELD WORK

1. *Reading the literature on the area*

- a. Before going into the field, the greatest familiarity possible should be acquired with the available literature, including (1) physiographic studies and their geologic basis, and (2) articles on economic and social conditions.
- b. Notes should be made on important points. In notes distinguish between abstracts and quotations. Cite author, title, and page. In some cases such notes should be taken into the field.
- c. Study pictures from the area. Illustrated pamphlets issued by railroads and steamship lines are helpful in many cases.

2. *Acquisition of maps*

- a. Those available may include topographic, geologic, soil, hydrographic, vegetation, climatic, and land office.
- b. Maps not available for field use may be traced or photographed.
- c. Maps intended for much use in the field should be cut in sections and mounted on cloth (paper muslin).

3. *Outline of campaign*

- a. Information of value in shaping field plans may be secured by correspondence with (1) well-informed residents of the area, such as merchants, bankers, county officials, experienced teachers, (2) members of geological, forest, and soil surveys.

* The outline embodies numerous corrections and additions suggested by the Seminar in Geography of the University of Chicago, before which it was presented in the Winter Quarter of 1915. In its preparation use was made of an unpublished outline by H. H. Barrows for a field class in the Cumberland Plateau and Southern Appalachians, of Hayes' Handbook for Field Geologists, and of a paper by D. W. Johnson on "Field Methods in Physiographic Geology," in Economic Geology, Vol. VIII, pp. 713-20. At the suggestion of the Editor, the outline was submitted to Wallace W. Atwood, Isaiah Bowman, W. H. Hobbs, Mark Jefferson, and Bailey Willis. Their comments and criticism have been used freely and hereby are gratefully acknowledged.

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- b. Before going into the field formulation of the purposes of the field work is desirable. Problems which may be encountered and theories to explain them should be outlined as far as possible. An objective attitude toward preconceived theories is necessary for their successful testing in the field.
- c. Make note of places to be studied and estimates of time to be spent at each. Revision of such preliminary plans often will be necessary, especially after reconnaissance (see II, I, a).
- d. The best means of covering the area should be investigated, whether on foot, horseback, with pack animals, wagon, livery rigs, automobile, bicycle, or boat. Effective observation, time, and cost are items to be considered in this connection.

II. FIELD METHODS

1. *The itinerary*

- a. If the region is unfamiliar, it usually is best to begin with a rapid trip through the area, to get general relations in mind.
- b. At type localities make intensive studies. These are necessary especially when the major part of the work is reconnaissance.
- c. Be sure that all types of areas have been studied before leaving the field.
- d. Do not consider it necessary always to cover in a given time all the ground planned.

2. *Hints on observation*

- a. Contrasts and comparisons of parts of the region one with another and with outside regions should be made frequently in the field.
- b. Time should be allowed for reflective observation in the field, especially from lookout points, such as hill or mountain tops.
- c. Because of the complexity of conditions in most cases, generalizations must be made with extreme care and only after much accurate observation. The geographer needs to guard against emphasizing geographic influences at the expense of non-geographic ones.

3. *Getting the view-point of the inhabitants*

- a. Become one of the people; live with them if possible; take part in their activities.
- b. Interview men of authority on local affairs, such as county officers—judges, assessor, clerk, recorder—prominent farmers, bankers, merchants, grain and stock buyers, and newspaper editors. Discount information from real estate agents.

4. *Keeping notes*

- a. The note-book should be of ample size (not much smaller than 5" x 8", nor too large to be carried in a pocket), should not contain a great many leaves, and should have stiff covers. Loose leaf note-books, the pages of which can be removed and filed, are recommended especially.
- b. Note-books and maps should have, in a conspicuous place, owner's name and address and provision for their return if found.
- c. Notes should be taken with a fairly hard pencil. Notes in ink are ruined if they become wet.
- d. Record date, locality, and brief title with notes. If loose-leaf note-book is used, date each page.
- e. Leave a generous margin, and ample space between notes.
- f. Take full, systematic notes in the order of their observation. Ordinarily do not attempt to classify notes at the time they are written.
- g. Write general impressions rather frequently.
- h. Write résumés before leaving one type of area for another.
- i. Distinguish carefully in notes between (1) observations, (2) inferences, and (3) information secured from others.
- j. Have a page for noting tentative hypotheses and unsolved problems.
- k. Supplement notes with sketches, block diagrams, and profiles.
- l. Keep a list of addresses of residents of wide local acquaintance and reliable judgment, to whom you may wish later to write for information.

5. *Use of maps*

- a. If practicable use one field map rather than several, recording all data on the one.
- b. Indicate precisely on map the localities discussed in notes; plot the itinerary.
- c. Some field workers advocate transferring all field mapping to an office map.

6. *Rainy day work*

- a. Write résumés and discussions of topics.
- b. Ink in data on maps and make necessary revisions.
- c. Gather statistics and other geographic data from local sources, such as court-house records, newspaper files, etc.

7. *Collection of views*

- a. Carry a camera ($3\frac{1}{4}'' \times 5\frac{1}{2}''$ or $3\frac{1}{4}'' \times 4\frac{1}{4}''$). Use much care in composition and exposure; views are of as much importance as notes.
- b. Record date, location, exposure, purpose for which view is taken, and direction in which camera is pointed. Indicate on map the places at which photographs are taken. Keep a separate page in the note book for a record of photographs (See IV, 3).
- c. From time to time have negatives developed so as to know whether camera is working properly.
- d. Gather good views from photographers, railroad traffic managers, manufacturers, etc.

III. FIELD OBSERVATIONS

In the following topics the aim is to stimulate observation from all geographic points of view; as a result, there is some duplication under related headings. Few regions have the wide range of material for which this outline provides, so that in most instances a number of topics will not need to be considered. Nearly all regions have special problems for which provision cannot be made in a general outline. Some of the topics, for example, "weather" and "discovery and settlement," cannot be studied to any great extent in ordinary field work. They should, however, be kept in mind, inasmuch as field observations may furnish useful "leads," which later can be expanded and verified. Field work raises many questions which must be solved, if at all, after leaving the field. Obviously, especial attention should be given to observations which have *geographic* content.

1. *Topography*

- a. Elevation above sea-level and amount of relief; relation to grade level.
- b. Larger features (plain, plateau, or mountain); general relations to each other; relation of region to its surroundings.
- c. Character in detail. Upland: area, distribution, direction and angle of slope. Valleys: distribution, size, shape, and trend of main and of tributary valleys, angle of slope of sides and gradient of floors, extent of flood plains, terraces, relation of size of streams to size of valleys. Configuration of the border between upland and lowland.
- d. Types of topography, in terms of their origin: influence of rocks and rock-structure, of gradient, of physiographic processes involved in shaping topography, of stage in cycle of erosion, and of previous cycles of erosion. In regional geography physiographic processes and history need be studied only in so far as their understanding makes possible causal descriptions of topography, drainage, and soils, such description giving in most cases the clearest picture.
- e. Topographic provinces: bases of differentiation, and character of boundaries.
- f. Effects of topography on climate, vegetation, animal life, industries, transportation and people.

2. Drainage

- a. Streams and stream systems: number, width, depth and volume of streams; variations in flow, areas flooded, frequency and duration of floods; gradient, erosion and deposition, configuration of channel, changes of channel, nature of bed; origin, age, adjustment or lack of adjustment to rock structure and drainage changes; drainage mesh; area and character of drainage basin.
- b. Lakes and ponds: distribution, number, size, depth, relation to streams and underground waters, character of shores; origin, changes in level, area, nature of shore and salinity.
- c. Swamps and marshes: extent, distribution, character, relation to stream flow; origin and changes.
- d. Underground drainage: relation to number, size, and flow of streams; variations in level of water table; springs (and wells), distribution, size, fluctuations of level and flow, character of water, relation to rock structure; features developed, such as caverns, sinks, and natural bridges.
- e. Relation of drainage to climate, vegetation, water power, navigation, land transportation, industrial, municipal and domestic water supply, irrigation, use and reclamation of wet lands, health resorts and recreation grounds, and distribution and character of population.

3. Soils

- a. Types: distribution; physical character, origin, mineral composition, texture, humus and water content, depth and nature of subsoil; soil provinces.
- b. Relation to native vegetation.
- c. Utilization as affected by drought resistance, ease of erosion, rate of exhaustion, "warmth" or "coldness"; kinds and qualities of crops grown; use of soils not suited to agriculture; land values on different soils.
- d. Problems of soil conservation: restoration of worn-out soils; checking soil erosion; improvement of defective soils, such as acid, alkali, "gumbo," and "hardpan" lands.

4. Mineral resources

- a. Kinds: distribution; structural, physiographic, and climatic conditions affecting distribution, quality, quantity, and accessibility.
- b. Development (see III, 12, c.).

5. Weather and climate

- a. Weather observations: daily range of temperature, absolute maximum and minimum temperatures, length of growing season, likelihood of frosts at beginning and end of growing season; sensible temperatures, humidity, rate of evaporation; cloudiness and sunshine; dews, mists and fogs; seasonal distribution, frequency, and character of rain, hail, and snow, duration of snow cover; strength and direction of winds, changes in wind directions; storms; frequency of changes in weather; etc. Local Weather Bureau men may furnish valuable data.
- b. Inferences concerning climate from the character of the topography, soil, drainage, vegetation, and crops.
- c. Climatic provinces: bases of determination; width of transition zones.
- d. Evidences of change of climate.

6. Coasts and shores

- a. Coast lines: horizontal and vertical configuration; headlands, peninsulas, islands, bays, sounds, beaches, bars, spits, marshes, and other features; origin and age of coast line, including changes of level, erosion of headlands and islands, deposition on- and off-shore; character and origin of harbors.
- b. Tides, shore-currents, waves: work of each in modifying coasts.
- c. Influence of coastal conditions on shipping, fishing, health and pleasure resorts, distribution of population.

7. Plant life

- a. Native vegetation: characteristic species, vegetation associations; aspect, density, luxuriance, and distribution in relation to climate, soil, water table, and topography.
- b. Influence on settlement and development of the region; changes in vegetation due to man.

8. Animal life

- a. Types of animals, character and distribution with reference to vegetation, climate, topography, and soil.
- b. Influence on settlement and development of the region; changes in animal life due to man.

9. Characteristics of the people

- a. Physique, health, traits.
- b. Social conditions: customs, dress, speech, religion, and political status.
- c. Buildings: architecture, materials used, furnishings, condition in which kept.
- d. Races: distribution, characteristics; influence of environment, with special reference to different development of different stocks in the same environment, and to survival of traits and institutions acquired in a previous environment (a fundamental geographic problem of great complexity, the interpretation of which requires great care and in many cases cannot be undertaken).

10. Exploration, settlement, and development

- a. Explorations: time and character, routes taken, influence on settlement.
- b. Settlements: locations and reasons for their choice; nativity of settlers, routes of approach of settlers; occupations and mode of living, means of communication, and political organization.
- c. Stages in the development of the region.

11. Distribution of population

- a. Density of population and changes of density as affected by geographic and other factors.
- b. Rural population: distribution; sites and plans of villages and individual farm groups; rate of growth as compared with that of urban population.
- c. Urban population: location, size, growth, and plan of cities; commercial, residential, and industrial districts; distribution of population by race, income, etc.; population density and land values by districts.
- d. Immigration and emigration: sources and destinations; reasons for movement, and economic, social, and political effects.

12. Economic activities

- a. Agriculture. Types of farming: (1) the growing of field-crops; size, location, and form of farms and of fields; proportion of land tilled; crops, variety, yields, advantages and disadvantages of each crop; husbandry; markets and marketing methods; (2) stock-raising: size and location of farms, proportion of land used for grazing; kinds and quality of animals, size of herds; methods of raising, preparing for market, and shipping; advantages and disadvantages of the region for stock-raising; (3) combination of crop-farming and stock-raising ("mixed farming"); (4) dairying, poultry-raising, gardening, and fruit-growing, as part of the general farm economy, and as independent industries. Values of land, proportion of improved and unimproved land, size and use of wood-lots; type and value of farm improvements, such as outbuildings and fences; influence of type of farming on distribution of population and social conditions; changes in farm practice, introduction of new crops and new types of farming; extension or restriction of producing area.
- b. Forest industries: location and size of forests; character of timber, as to species, density, and quality; methods of cutting and logging; character and distribution of lumbering, wood-pulp, and wood-working industries; other forest industries, such as turpentining and tan-bark

gathering; by-product industries; value of products; transportation and markets; future developments, needs and possibilities of conservation; relation to farming and manufacturing; conditions and characteristics of the workers.

- c. Hunting and fishing: products; possibilities of domesticating animals; economic and social influences, especially in the early development of the region.
- d. Mineral industries: (see III, 4) distribution of mines, pits, quarries, and wells; methods of production, losses, and wastes; availability of power; markets; competing regions; effect on other industries; future of the mineral industries and influence on the future of the region; nature of mining centers, life and characteristics of the miners.
- e. Manufactures: distribution as determined by raw materials (local or imported), power, labor, transportation, markets, capital, early start, and individual initiative; size of establishments; growth and changes of industries; relation of manufacturing industries to each other and to other industries at various stages in development of region; relations to competing areas; social conditions and political interests; future of existing and possibilities of new industries.
- f. Transportation: trails, roads, rivers, canals, lakes, and railroads; distribution and character of routes as affected by topography, soils and rocks, drainage, climate, vegetation, natural resources, industries, and population; significance in the development of the area; effect of transportation conditions on the activities and character of the people; transportation problems at different periods.
- g. Commerce: trade within the region and with outside regions; commodities exchanged, places from which they come and to which they go; methods of transportation; package or bulk freight; trade routes; trade centers, cities, towns, country stores, areas tributary to each, competition between centers, advantages and disadvantages of each center, trade general or specialized; bartering; changes in character of trade in past and probable future changes; influence of trade on distribution and character of population.
- h. Recreation and tourist business: types of resorts, attractions, length of season, sources of visitors; accessibility; general influence on localities concerned.
- i. Relative importance of different economic activities; degree to which specialization of individual workers has taken place.

13. Geographic provinces

- a. Distinguish as geographic provinces regions within which there is essential unity of physical environment and consequently of economic conditions (Dryer). Topography, drainage, climate, vegetation, soils, mineral resources, and position with reference to other regions should be considered in differentiating such provinces.
- b. Boundaries: how determined, clear or indistinct (transition zones); relation to political boundaries.

IV. OFFICE WORK AFTER THE FIELD SEASON PRELIMINARY TO WRITING REPORT

- 1. Transcribing field-notes.
The chronological field-notes should be transcribed under topical headings; cross-references in some cases desirable. One of the most convenient methods is the use of loose sheets or cards, which, together with reading notes, can be filed according to topics.
- 2. The original field-notes and maps should be accessible while report is being written.
- 3. Numbering and filing of negatives.
Negative albums are convenient for the filing of films. (The Eastman negative album is one of the best.) A number should be put on blank margins (not the developed portion) of each negative in water-proof India ink. Title of negative, with date and place, should be written on each negative envelope in pencil.